# 3GPP TR 32.853 V11.0.0 (2012-09)

*Technical Report*

# 3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Telecommunication management; Final report from the 3GPP - TM Forum Joint Work Group (JWG) on fault management harmonization (Release 11)


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NGMN, NGCOR, Converged Management, FM

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# Foreword

This Technical Report has been produced by the 3rd Generation Partnership Project (3GPP).

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version x.y.z

where:

- x the first digit:
  - 1 presented to TSG for information;
  - 2 presented to TSG for approval;
  - 3 or greater indicates TSG approved document under change control.
- y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- z the third digit is incremented when editorial only changes have been incorporated in the document.

## Ready for Converged Management

This specification is part of a set that has been developed for converged management solutions.

# 1 Executive summary

## 1.1 Purpose

This document is the report of the 3GPP™ SA5 / TM Forum NGWW Joint Work Group on Fault Management Harmonization. The analysis and recommendations in it are offered to 3GPP and TM Forum for further consideration in their work on Fault Management.

## 1.2 Main results

This report discusses 43 items, ranging from major structural aspects of the 3GPP SA5 and TM Forum TIP RAM Fault Management solutions to some more detailed points. The results are:

- 26 items: a recommendation on how to reach alignment was agreed (or were already aligned);
- 16 items: no recommendation on alignment could be agreed;
- 1 item: initially considered, but concluded to be out of scope.

The most important item on which no agreement could be reached concerns the way alarms and/or alarm notifications are uniquely identified.

It should be noted that the study addressed in the first place the differences between the 3GPP and the TM Forum Fault Management solutions. A consequence is that this report does not list the majority of the items in which the solutions are already aligned.

If alignment is reported, that is either because the alignment was attained as a result of this study, or because it existed already but was not recognized earlier. Against this background, the number of the subjects in this document which are labeled “no agreement reached” should not be taken as a indication that the 3GPP and TM Forum solutions are far apart - in reality there are much more subjects on which both solutions are aligned than on which they are not aligned.

The document concludes with a general discussion and proposal on interface harmonization.

## 1.3 Common Stage 2 Specification

During the study, the mutual clarifications and careful comparisons of both solutions led to the insight that it may be possible to construct a common 3GPP - TM Forum Stage 2 Fault Management Interface specification. The JWG suggests that this work may be the subject for a follow-up study.

# 2 References

The following documents contain provisions that, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TM Forum Joint Work Group Model Alignment
http://webapp.etsi.org/meetingDocuments/ViewDocumentList.asp?MTG_Id=28916

[2] 3GPP TR 32.832: "Study on Alarm Correlation and Alarm Root Cause Analysis"
http://www.3gpp.org/ftp/Specs/html-info/32832

[3] 3GPP TS 32.101: "Principles and high level requirements" http://www.3gpp.org/ftp/Specs/html-info/32101

[4] 3GPP TS 32.111-2: "Alarm Integration Reference Point (IRP) Information Service (IS)"
http://www.3gpp.org/ftp/Specs/html-info/32111-2

[5] 3GPP TS 32.111-6: "Alarm Integration Reference Point (IRP): Solution Set (SS) definitions"
http://www.3gpp.org/ftp/Specs/html-info/32111-6

[6] 3GPP 32.xxx series: OAM&P and Charging http://www.3gpp.org/ftp/Specs/html-info/32-series.htm

[7] 3GPP2 S.S0028-E v1.0: "OAM&P for cdma2000"
http://www.3gpp2.org/public_html/specs/S.S0028-E_v1.0_OAMP_3GPP2_R8.pdf

[8] ATM Forum Technical Specifications: "M4 Network View CMIP MIB Spec" v1.0
http://www.broadband-forum.org/ftp/pub/approved-specs/af-nm-0073.000.pdf

[9] ITU-T Recommendation 9: "Information technology – Open Systems Interconnection – Common Management Information service" http://www.itu.int/rec/T-REC-9-199710-I

[10] ITU-T Recommendation X.733: "Information technology – Open Systems Interconnection – Systems Management Alarm reporting function" http://www.itu.int/rec/T-REC-X.733-199202-I

[11] Metro Ethernet Forum MEF 7.1 Phase 2: "EMS-NMS Information Model"
http://www.metroethernetforum.org/PDF_Documents/technical-specifications/MEF7.1.pdf

[12] TM Forum: "MTOSI specifications" http://www.tmforum.org/MTOSIRelease21/11998/home.html

[13] TM Forum: "Integration Framework"
http://www.tmforum.org/IntegrationFramework/4866/home.html

[14] TM Forum: "Applications Framework"
http://www.tmforum.org/BestPracticesStandards/ApplicationFramework/2322/Home.html

[15] TM Forum JSR 263: "Fault Management API" v1.0
http://www.tmforum.org/browse.aspx?catID=4037&docID=6860

[16] TM Forum Resource Alarm Management Supporting Document: "Definition of RAM Profiles"
ftp://ftp.3gpp.org/TSG_SA/WG5_TM/Ad-hoc_meetings/Virtual-TMF/S5eTMF0121.zip

[17] TM Forum SD1-44: "Connectionless Technology Management"
http://www.tmforum.org/browse.aspx?linkID=32953&docID=10316

[18] TM Forum: "Resource Alarm Management Information Agreement"
http://www.tmforum.org/browse.aspx?linkID=47081&docID=16108

[19] TM Forum TMF524: "Resource Alarm Management Business Agreement" Rel 1.1, Version 1.5
http://www.tmforum.org/browse.aspx?linkID=47081&docID=16099

[20] TM Forum TR167: "Fault Management Interface Comparison"
ftp://ftp.3gpp.org/TSG_SA/WG5_TM/Ad-hoc_meetings/Virtual-TMF/S5eTMF0090.zip

[21] 3GPP / TM Forum JWG FMH: "3GPP SA5 - TM Forum TIP Fault Management Harmonization Final report from the Joint Work Group ad hoc" V1.1

[22] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

# 3 Definitions, symbols and abbreviations

For the purposes of the present document, the terms and definitions given in TR 21.905 [11] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in TR 21.905 [22].

## 3.1 Definitions

No specific terms were defined during the generation of this document.

## 3.2 Symbols

No specific symbols were defined during the generation of this document.

## 3.3 Abbreviations

For the purposes of the present document, the abbreviations given in TR 21.905 [22] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in TR 21.905 [22].

| | |
|---|---|
| AC | Alarm Correlation |
| BA | Business Agreement (Stage 1 interface specification in TM Forum) |
| CMIP | Common Management Interface Protocol |
| CORBA | Common Object Request Broker Architecture |
| EMS | Element Management System |
| FM | Fault Management |
| FMH | Fault Management Harmonization |
| IA | Information Agreement (Stage 2 interface specification in TM Forum) |
| IRP | Integration Reference Point (ref. 3GPP TS 32.150) |
| IS | Information Service (Stage 2 interface specification in 3GPP) |
| Itf-N | Interface-N (ref. 3GPP TS 32.101) |
| ITU-T | International Telecommunication Union - Telecommunication Standardization Sector |
| NE | Network Element |
| NGCOR | Next Generation Converged Operations Requirements (Project in the Next Generation Mobile Networks Alliance (NGMN)) |
| NGMN | Next Generation Mobile Networks |
| NGWW | Next Generation Wireline Wireless (an initiative in TM Forum) |
| NM | Network Management |
| OMG | Object Management Group |
| OSS | Operations Support System |
| RAM | Resource Alarm Management (organizational entity in TM Forum) |
| RCA | Root Cause Analysis |
| SA5 | Work Group 5 of the 3GPP Technical Specification Group 'Service and System Aspects' (organizational entity in 3GPP) |
| SON | Self Organizing Networks (ref. 3GPP TR 21.905) |
| SS | Solution Set (Stage 3 interface specification in 3GPP) |
| TIP | TM Forum Integration Program (organizational entity in TM Forum) |
| W3C | World Wide Web Consortium |
| XML | eXtended Markup Language |

# 4 Introduction

## 4.1 Background

The background of the Fault Management Harmonization (FMH) project is the desire by operators and vendors to reduce the integration tax and the network operating cost, which is believed to be possible by converging 3GPP and TM Forum fault management solutions.

The FMH team did a detailed comparison of the semantics of alarm management specifications from 3GPP and from TM Forum and formulated a number of proposed changes to both specifications. This document describes the outcome of that work.

In 2010, 3GPP SA5 and TM Forum NGWW agreed to start a study on the possibility to come to a single set of management specifications which should work for wireless as well as for wireline networks. Fault Management (FM) was chosen as one of the pilot subjects. From the start, it was clear that the simplest solution towards unification, being to stop the work on one of the two solutions and promote the other solution as the single future solution for converged network management was not feasible. Installed base and existing preferences in the market did not allow that solution. Therefore the joint working group on FM harmonization decided to consider in detail the differences between the 3GPP and the TM Forum FM solutions and to discuss ways to remove those differences as much as possible so that the two solutions would evolve in a convergent way, instead of each being further developed independent of the other one.

It was recognized that just agreeing on syntactical matters would not be very helpful as the major effort in integration of different management solutions is in the alignment of semantic matters. Therefore it was agreed to work towards semantic harmonization.

## 4.2 Semantic harmonization

Semantic harmonization comprises in the first place a common understanding of the nature and the meaning of the concepts which make up both FM solutions. Secondly, it requires that the information representing an alarm from the wireless realm is similar enough to the information representing an alarm from the wireline realm to allow meaningful comparison. Example: "alarm raise time" should have the same meaning for both realms, because correlation, based the observation that alarms were raise (almost) simultaneously, will not be possible if the definitions of this piece of information would be too different. Thirdly, semantic harmonization requires that to a client similar controls are available to interact with agents from both realms. Example: executing an "alarm acknowledge" action should cause the same state transition in agents from both realms. Note that "clients" is used here in a very generic sense: it includes applications in higher layer management systems as well as human operators. Specifically, semantic harmonization means:

- Alignment of the meaning of data structure (or data elements) as well as operational capabilities (instructions) on information level;
- Does allow different encoding on protocol-level of data structures (or data elements) and instructions to be transferred over an interface.

In this way, semantic harmonization should make it much easier for clients to work with networks comprising FM agents which support 3GPP specified FM interfaces, as well as FM agents which support TM Forum specified FM interfaces: a client can use one user virtual model, will get comparable alarm information from both realms and will have comparable controls at his disposal for both realms. Specifically:

- Applications, databases and user-interfaces can rely on working with the semantically identical data structures (or data elements) and operational capabilities even if information is transferred over interfaces using different encodings.

## 4.3 Underlying assumptions

At the beginning of the harmonization exercise, TIP_RAM was at version v0.2 and as a result of the harmonization discussions, a number of changes have been done in the TIP_RAM specifications and are now part of version 1.0 of the TIP_RAM interface. The present document is using the TIP RAM v1.0 specifications, and indicates where changes were made as a result of the harmonization discussions.

SA5 launched the following Study Work Items in response of the need for Converged Management regarding fault management.

a) Study on Harmonization of 3GPP Alarm IRP and TMF Interface Program (TIP) Fault Management

b) Study on Alarm correlation and alarm root cause analysis

c) Study on Management of Converged Networks (480047)

The purpose of using Study Work Item is to a) record the Change Requests (CRs) identified during the Study and b) review and revise the recorded CRs and then issue the CRs, to effect actual changes to specifications. The recommendations from JWG Fault harmonization group, which is run in parallel with the Study Work Item groups, is expected to be a prime source of "required changes".

During the course of the Study, SA5 came to the realization that the JWG harmonization group prime focus has changed, due to practical reasons, from "elimination of SILO" to semantics alignment of the two SILO, i.e. the Alarm IRP and new TIP_RAM, the candidate to replace the MTOSI and the OSS/J fault management protocols.

On that realization, SA5 concluded Study Work Item a) and b) earlier (than originally planned since no syntactical alignment needs to be considered) and issue CRs to current set of Alarm IRP specifications. One can find markers indicating those CRs. Upon receiving JWG concluding recommendations, SA5 will consider if further CRs are necessary, via Study Work Item c).

## 4.4 Document structure

After a the present introductory section, there is a section on Commonalities, followed by sections, organized by category of difference:

- structural differences, that can have multiple impacts,
- functional differences,
- minor differences.

Within each category, object model, notification and operations differences are covered.

## 4.5 Subsection structure

Each subsection is composed of the following parts:

- a description of the addressed item, identifying relevant differences between the 3GPP and the TM Forum solutions or approaches;
- a Recommendation, describing the way in which harmonization can be obtained, this Recommendation is agreed by the working group and offered for further consideration to 3GPP and TM Forum;
- a status indicator, indicating the status of the Recommendation:

  **A:** agreed Recommendation on how to reach harmonization

  **D:** agreement on a Recommendation on how to reach harmonization could not be reached

# 5 Commonalities

The SA5 and TIP Fault Management interfaces are sharing the same objects, alarm, monitored entity and comments. Even if some objects like alarm list are not explicitly modeled in TIP_RAM_IA [18], these objects are support objects in SA5_FM_IS [4] and not explicitly used in generated interface. In summary, we could say that the 2 interfaces have about 90% commonality.

The alarm object has 30 attributes that are common to both interfaces, out of which only 1 (threshold information) has a different syntax in the 2 interfaces. SA5_FM_IS has 3 additional attributes (notification id, correlatedNotifications and StateChangeDefinition) compared to TIP_RAM_IA and TIP_RAM_IA has 8 additional attributes, mainly coming from the additional requirements present in TIP_RAM_BA [19].

In terms of notifications, both interfaces share the same notifications, except for the notifyComments that is merged in the notifyChangedAlarm in TIP_RAM_IA.

In terms of operations, the 6 operations present in SA5_FM_IS are also present in TIP_RAM_IA, even if the latter has 6 additional operations, 1 getAlarm operation, 2 setAlarm operations, 1 createAlarm, group/ungroupAlarm directives and getTrackingRecord. Apart from the get operation, the other ones are related to the additional requirements present in TIP_RAM_IA.

Note that differences in the syntax carried on the wire are outside of the scope of this document. Focus is only on the semantics.

# 6 Structural Differences

## 6.1 OSS-to-OSS System Context

**Description:**

This point refers to section 1.1 of TR167 [20].

SA5 NM-layer alarm management interface capabilities:

- 3GPP Alarm IRP is usable also on NM-layer interactions (as sufficiently generic and providing required functionality for transfer and management of alarm information)
- 3GPP plans that if additional functionality is needed on NM-layer interactions (supported by agreed use cases and architectural definitions), such interaction should be defined in a separate interface specification.

SA5 does not consider it necessary to define a standard interface between alarm correlation function and the alarm management system (e.g. NGCOR does not have this requirement), such as in the case of the planned TIP_RAM_IA.

TIP_RAM_IA defines an OSS-to-OSS business scenario [14]. This scenario drives a number of new attributes (serviceAffecting, potentialRootCauseIndication) and new directives (set, create).

While some attributes like escalation and directives like create are quite specific to OSS-to-OSS (interfaces 3 or 4 in TR 32.101, figure 1 [3], most of the others can also be applied to Itf-N system context.

TIP_RAM_IA now includes a separate profile, named "Enhanced profile", covering the OSS-OSS scenario. A supporting document, TIP_RAM_Profiles [16], describes the various RAM profiles. The Enhanced Profile was added for clarifying the scope of the harmonization.

Unless explicitly stated otherwise, the rest of this document uses the Standard profile of TIP_RAM as reference for comparison.

**Recommendation:** It was recognized that there is a difference of opinion between 3GPP SA5 and TIP RAM on solutions for FM related OSS-OSS interfaces, based on use cases discussed.

It was agreed that this interface is out of scope for the present harmonization work. Contributions from operators are invited on the subject (that is the need for an open interface between an alarm correlation function and an alarm management system).

**Status:** D

## 6.2 Alarm Id

**Description:**

Both SA5_FM_IS and TIP_RAM_IA define an alarmId that uniquely identifies an alarm record within an active alarm list. However there is some difference in the definition.

3GPP guarantees that the scope of uniqueness is the active alarm list. 3GPP does not specify when an alarmId can be reused. This implies that the alarmId can be reused as soon as the alarm is removed from the alarm list.

In TIP RAM, the identifier is considered as the unique field for identifying alarms. The use of the identifier (alarmId plus context) allows consistency of identification when the RAM interfaces is used at various levels, i.e. between EMS and NMS and between NMSs. TIP RAM specifies that, when an alarm-owning system needs to assign an AlarmId, an AlarmId once used in an alarm list should never be reused.

Clients might keep reference to alarmIds and if their lifecycle is not synchronized and if alarmIds are reused, then some operations (ack or grouping) might end up being done on the wrong alarm. Alarm Ids are also used for correlating alarms and uniqueness is also required for this purpose.

TIP_RAM is considering that the use of 2 identifiers, alarm id and notification id for identifying the same information, i.e. the alarm record, is making the job of the NMS (IRP Manager) more complex, as it has to maintain both as indexes and use one or the other depending on the context.

SA5 approach to alarm management:

1. The alarm ID is used as a handle for use by IRPManager and Alarm IRPAgent to identify current active alarms stored in the IRPAgent's alarm list.
2. A notification can carry alarm information and non-alarm information (such as "Software V1.2 is activated").
3. The notification system uses a notification ID that is guaranteed never be reused by that notification system.
4. The alarm correlation capability is expected/required not only to correlate active alarms but can correlate alarms, including non-active alarms and events, such as "software version 2.1 is now activated".

In this regard, SA5 defined alarm correlation capability uses notification ID to identify both alarms (both active and non-active such as logged) and event.

SA5 considers it to be redundant to expand its alarm ID uniqueness scope (beyond its current defined scope of active alarm list), given that the use of Notification ID is sufficient (support bullet-2) and necessary (support bullet-3).

**Recommendation:** It was recognized that there is a difference of opinion between 3GPP SA5 and TIP RAM on the subject.

Contributions from operators are invited on requirements for standardization for correlation between alarms and events.

**Status:** D

## 6.3 Notification Id

**Description:**

SA5_FM_IS uses notificationId as defined in the notification header. 3GPP uses notification to carry alarm information (e.g. notifyNewAlarm) and other information such as network configuration change information (e.g. notifyObjectCreation). Notification has two parts, i.e. Header and Body. Header has a parameter called notificationID. Body can be alarm information or other information such as configuration management information. The usage of notification ID is identical to that used in ITU-T TMN [9] to uniquely identify an instance of notification from other instances.

In SA5 FM, the usage of notificationId is the one way to guarantee unique alarm identifications for correlation purposes. However, the usage of notificationId is the only way to guarantee uniqueness to support correlation of alarms and events.

TIP_RAM does not use notificationId. NotificationId is not defined in TIP BaseNotification as there is no event logging facility today in TIP. TIP_RAM uses an identifier (alarmId plus context) to uniquely identify alarms for alarm correlation and for directives.

**Recommendation:** In TIP, notificationId is out of scope for RAM, so harmonization of this item is concluded not to be possible within the current scope of the Fault Management Harmonization team.

**Status:** D

## 6.4 Threshold Information

**Description:**

This point refers to section 2.3 of TR167 [20].

SA5_FM_IS thresholdInformation is identical to ITU-T X.733 thresholdInformation X.733 [10].

TIP_RAM_IA thresholdInformation has been defined in cooperation with the RSA PM team as part of the internal TM Forum harmonization. Differences with 3GPP are:

- TIP RAM includes thresholdId and thresholdCrossingDescription;

- TIP RAM supports thresholdInformation related to multiple monitored attributes. For this case, the trigger condition, i.e. the specific combination of monitored attribute values which generates a threshold crossing alarm, is vendor specific;
- TIP RAM thresholdInformation can carry historical threshold crossing information;
- TIP RAM does not provide armtime, and low and high values, for single attribute thresholds.

It is noted that this subject, although closely related to Fault Management, is really inside Performance Management and cannot be resolved within the scope of the FMH project.

**Recommendation:** None. It was agreed that this item is out of scope for the FMH project.

**Status:** -

## 6.5 Alarm Correlation

**Description:**

SA5 has completed TR 32.832 [2], a study on Alarm Correlation (consisting of AC1 and AC2 functions) and Alarm Root Cause Analysis (RCA). 3GPP has completed the work on the AC1 function and on RCA and will start working on AC2 in the near future.

TIP RAM supports the AC1 function and the RCA function but does not (yet) support the AC2 function and it does not support correlation involving non-alarm-type events.

**Recommendation:** TIP RAM should start to study AC2, in order to harmonize its solution in the study and design phases with the solution being designed in 3GPP.

**Status:** A

## 6.6 Distinction of correlation and root cause

**Description:**

The SA5 specification makes a distinction between alarm correlation and (alarm) root cause analysis. The specification provides capability for clients to be aware of the distinction.

Alarm correlation identifies a set of related alarms/events whose root cause highly probably is the same, but which root cause is not identified.

Root cause analysis identifies a root cause of a set of alarms/events, together with the set of related alarms/events.

It is common for root-cause-analysis 'engine/algorithm/function' to know the correlation (of a set of alarms) but still not be able to identify its cause. In such case, the SA5 specified capability allows such knowledge (i.e. correlation only) be made known to client, aiding the client to determine the root cause. Without such capability, the correlation result is lost.

In the modeling of these capabilities, 3GPP follow ITU-T specifications.

TIP_RAM is using similar concept of alarm grouping and root cause analysis:

- Alarm grouping, using the parent-underlying relationship between alarms, allowing building groups of alarms related to a parent. It indicates a correlation between alarms, but does not indicate that the selected parent is a potential root cause.
- Potential root cause indication: this flag indicates that a given alarm at a given point of the analysis is a potential root cause. It can be set independently of the grouping or might be done simultaneously.

**Recommendation:**

It is concluded that both solutions provide the same capabilities: alarm grouping/correlation and root cause identification. However, alarm grouping/correlation has been modeled in different ways.

**Status:** D

## 6.7 Correlating alarm with event

**Description:**

3GPP supports a capability allowing indication of correlation result that includes events (not just alarms). The motivation is to recognize the fact that many managed resources emit events (not alarms) that are related to alarms or caused by or causing emission of alarms. Availability of this capability is becoming more urgent in the mobile network management when SON functions will be implemented.

Correlation of alarms with events is considered as out of scope for TIP_RAM Release 1.0. A standard event logging facility and interface would be a prerequisite for offering generalized access to events.

**Recommendation:** refer to section 3.2

**Status:** refer to section 3.2

## 6.8 Handling of non-active alarms

**Description:**

3GPP supports a capability, the Notification Log IRP, allowing a client to query historical alarms (i.e. those that are no longer in AlarmList). It is used to aid post processing, e.g. study of trends and is essential for preventive maintenance.

In TIP_RAM, an alarm can be removed from the alarm list as soon as it is cleared (or cleared and acknowledged) but the decision to remove it from the alarm list is considered implementation-specific. Non-active alarms are by default not visible across the interface unless when using a get by id, however, an active alarm can be grouped to a non-active alarm as long as it is in the alarm list.

Long-term access to alarms in data warehouse or for reporting or long term trending is considered as out of scope of the RAM interface. A generic event logging facility is not specified today in TIP.

**Recommendation:** The difference between 3GPP SA5 and TIP RAM on this point is because of different requirements. Guidance from operators would be appreciated.

**Status:** D

# 7 Functional Differences

## 7.1 Object Model

### 7.1.1 Probable Cause

**Description:**

SA5_FM_IS defines the probable cause as an enumeration,

The 3GPP approach to extension of the set of probable causes is:

- Its stage-2 specification defines X number of probable causes and does not allow vendor-extension;
- Its stage-3 protocol allows X legal values.
- If group agreed to have two more PC, a new release Stage-2 will define X+2 probable causes and its corresponding released stage-3 protocol would allows X+2 legal values.

TIP_RAM_IA defines the probable cause as a string with qualified text. The possible values will be defined outside of the RAM specification for simpler extensibility.

The TIP_RAM approach to extension is:

- define X number of probable causes and does not allow vendor-extension; this definition is in separate document (called Y) than the "protocol specification" document.
- protocol allows any values.
- If group agreed to have two more probable causes, an updated version of document Y will be released.

**Recommendation:** It was concluded that the solutions are semantically aligned, no changes required.

**Status:** A

### 7.1.2 Acknowledgement information

**Description:**

Both interfaces have an ackState with similar values. The same is true for ackTime and ackUserId.

These attributes are optional for TIP_RAM_IA because specifying them as mandatory was considered to make the interface more complex than required.

3GPP made support of acknowledgement mandatory because without it a raised and subsequently cleared alarm can be removed from the active alarm list without the IRPManager being aware.

After reconsideration by the TIP RAM team of the reasons and effects of making the Acknowledge directive mandatory, it was confirmed that the Acknowledge directive stays optional in TIP RAM.

**Recommendation:** Both teams believe they have reasons to keep their solution, so no agreement for harmonization could be reached.

**Status:** D

### 7.1.3 Settable alarm fields

**Description:**

SA5 approach:

Suppose a node is "in testing" or "its full capacity will support 0.5 % traffic of an VIP-customer". The "settable alarm fields" capability would allows an IRPManager to configure such node to report alarm with severity level to minor even when the node capacity is reduced to 2 % of its planned capacity.

Our analysis concludes the provision of such capability is not useful, if not harmful. Our conclusion is that the level of perceived severity should reflect the view point of the alarmed node, e.g. reflect the severity of capacity degradation with respect to its planned capacity.

The above comments are applicable to other settable alarm fields listed in the first paragraph of 3.1.4.

It should be noted that SA5, in its TR for Alarm Correlation, have identified the need to add new attributes whose values are settable by IRPManager. These settable attributes would reflect the view of the IRPManager while the 'traditional' attributes remained not-settable-by-IRPManager and would remain to reflect the view of the alarmed node.

The TIP RAM team considers that an alarm is a combination of information coming from the element (perceived severity, specific problem, proposed repair actions, additional text, backup status + object, alarm escalation) and management information (service affecting, potential root cause indication).

In the Standard profile used as reference for comparison, the information coming from the element is not settable by the client, but the management information, i.e. the 2 attributes: service affecting and potential root cause indication, is settable by the client.

For the Enhanced profile, TIP RAM allows 9 alarm attributes to be set by the client: perceived severity, specific problem, proposed repair actions, additional Text, backup status + object, alarm escalation, service affecting, potential root cause indication.

Note that at the beginning of the harmonization exercise, TIP RAM was considering making all 9 alarm attributes above settable and the list was reduced to the 2 management information attributes following the FM Harmonization discussion for better semantic alignment.

**Recommendation:** SA5 is studying the use of the service affecting parameter (new), the outcome is not yet clear.

**Status:** D

### 7.1.4 User Id

**Description:**

For SA5_FM_IS, the user id attributes (ack, clear) and corresponding notification attributes and operation parameters are seen as mandatory.

For TIP_RAM_IA, the user id attributes were optional. These attributes and the corresponding notification attributes are now mandatory for the standard alarm profile.

Hence 3GPP and TIP are aligned.

**Recommendation:** no changes needed

**Status:** A

## 7.2 Notifications

### 7.2.1 AlarmListRebuilt

**Description:**

The notification notifyAlarmListRebuilt is mandatory in SA5_FM_IS.

The notification notifyAlarmListRebuilt is also mandatory in the Standard profile of TIP_RAM.

At the beginning of the harmonization exercise, this notification was optional in the standard profile of TIP_RAM_IA and this was changed for better semantic alignment.

It remains not supported in the Simple Alarm Reporting profile of TIP_RAM.

**Recommendation:** After the change in TIP_RAM_IA, there is semantical alignment; no further changes needed.

**Status:** A

### 7.2.2 NotificationType

**Description:**

SA5_FM_IS and TIP_RAM_IA have both a solution for a sender to indicate the type of notification. There is no difference in semantics; but on xml level there is a syntactical difference. The encoding of this in the 3GPP Solution Set [5] for xml may have duplicated information to indicate "type of notification".

**Recommendation:** no change

**Status:** A

## 7.3 Operations

### 7.3.1 Get directives

#### 7.3.1.1 getResourceAlarm

**Description:**

TIP_RAM is defining 2 get directives:

- getResourceAlarms that allow returning all the alarms in the alarm list matching a filter,
- getResourceAlarm that returns a single alarm matching the alarm Id provided in the input.

While the functionality of the second operation (getResourceAlarm) can be achieved by the first one (getResourceAlarms) passing a filter carrying the alarm Id, the getResourceAlarm is considered as an accelerator when the content of a single alarm is needed.

The SA5 Alarm IRP has getAlarmList(,,,filter,,,).

Invoking this operation with filter has the same effect as TIP_RAM_IA's getResourceAlarms.

Invoking this operation with filter carrying alarmID has the same effect as TIP_RAM_IA's getResourceAlarm.

**Recommendation:** It was concluded that the solutions are semantically aligned, no changes required.

**Status:** A

#### 7.3.1.2 getResourceAlarms

**Description:**

TIP RAM is providing a getResourceAlarms directive with an input parameter for getting alarms in a given state (alarmAckState) as well as a filter. The alarmAckState parameter has the same set of values as the one in SA5 Alarm IRP. The getResourceAlarms does not provide a dedicated input parameter to get all alarm matching a given object as this functionality can be achieved by setting a filter carrying the given object.

At the beginning of the harmonization exercise, TIP_RAM had 2 additional get directives:

- getAllActiveAlarms. This directive was used for getting all active alarms in the Simple Alarm Reporting profile. This directive was replaced by adding the alarmAckState parameter to the getResourceAlarms directive, with the same set of values as SA5_FM_IS.
- getResourceAlarmIds. The functionality of this directive can be achieved by using the getResourceAlarms, setting the attribute selector to alarm Id.

These 2 directives were removed for better semantic alignment

SA5_FM_IS has a single getAlarmList directive with input parameters for getting alarms in a given state and/or matching a given object, in addition to the filter.

**Recommendation:** It was concluded that the solutions are now semantically aligned, no further changes required

**Status:** A

#### 7.3.1.3 Attribute selector

**Description:**

TIP_RAM_IA offers the capability in the getResourceAlarms directive to select this list of alarm attributes that will be returned with each alarm matching the criteria. The optional input parameter "attribute selector" can be filled with a set of alarm field names. In this case, only the listed fields will be returned for each alarm matching the criteria. If the attribute selector is empty or not present, all the fields of each alarm are returned. This parameter is available in all profiles.

[SA5] SA5 Alarm IRP does not support an operation allowing IRPManager to specify which alarm attributes that shall be required to be carried in alarm notification and in response of getAlarmList:

1. to this particular IRPManager (the requester) or
2. to all IRPManagers who have subscription to notification of alarms or issue getAlarmList.

SA5 has discussed this topic and not identified a meaningful use case leading to the addition of such a capability. In addition SA5 is unclear of the behaviour of the system (see (1) and (2) above).

**Recommendation:** The difference between 3GPP SA5 and TIP_RAM on this point is because of the lack of requirements. Guidance from operators would be appreciated.

**Status:** D

### 7.3.2 Set directives

**Description:**

SA5_FM_IS does not have this capability. 3GPP considers this capability for all attributes to be related to OSS-OSS interfaces only; this 3GPP position is documented in [TR 32.829].

TIP_RAM_IA defines 2 set directives, which can set attribute values on records currently present in the AlarmList:

- setResourceAlarm, for setting a single object by Id;
- setResourceAlarms, for setting multiple objects by filter.

These directives are only available in the Standard (equivalent to Itf-N) and Enhanced profiles.

The settable attribute values are described in TIP_RAM_Profiles [16].

For the Standard profile, the following attribute values are settable:

- serviceAffecting
- potentialRootCauseIndication.

All TIP interfaces supporting set operations allow setting the aliasNames and extensionInfo attributes of the object being set. aliasNames allows providing aliases for the name of the object (alarm Id for alarm) and extensionInfo allows

carrying vendor extension in the alarm. TIP_RAM recommends the FM agent not to fill the aliasName and recommends the manager not to set those 2 attributes.

**Recommendation:** It is needed to open a dialogue between operators, OSS vendors and equipment vendors to get clarification on this subject.

**Status:** D

### 7.3.3 Create directive

**Description:**

SA5 does not support a standard interface between its defined Alarm management system and its defined alarm correlation function (e.g. NGCOR does not have this requirement). SA5 considers the correlation function is an additional, non-mandatory capability or function within the defined Alarm management system. Internal interfaces among functions of Alarm management system are not 'externalized' (or standardized). See also the 3GPP SA5 description for section 2.1.

TIP_RAM_IA defines a create directive for the OSS-to-OSS scenario in the Enhanced profile that is not part of the scope of SA5_FM_IS. This is related to the point on the OSS-to-OSS scenario (refer to section 2.1).

**Recommendation:** It was recognized that there is a difference of opinion between 3GPP SA5 and TIP RAM on solutions for FM related OSS-OSS interfaces, based on use cases discussed.

It was agreed that this interface is out of scope for the present harmonization work. Contributions from operators are invited on the subject (that is the need for an open interface between an alarm correlation function and an alarm management system).

**Status:** D

### 7.3.4 Async mode

**Description:**

SA5_FM_IS is defining 2 modes for the getAlarmList directive: synchronous and asynchronous using events. Asynchronous mode is only supported by CMIP SS, which has been retired since Release 7. SA5 is working on a CR to remove the asynchronous mode from SA5_FM_IS.

TIP_RAM does not support asynchronous directive response.

**Recommendation:** After the change has been implemented by SA5, no further changes are needed.

**Status:** A

### 7.3.5 Output of directives

**Description:**

For unack, clear and comment directives, SA5_FM_IS returns a structure containing alarmId indicating the alarms that are *not* successfully unacked or cleared. Also a failure code is returned to indicate why the unack or clear was not successful.

TIP RAM is also returning for the unack, clear and comment directives a structure containing the ids of the failed objects with a failure code as string.

At the beginning of the harmonization exercise, TIP RAM was returning the ids of the objects successfully modified and no failure reason. This was changed for better semantic alignment.

**Recommendation:** No further changes required.

**Status:** A

### 7.3.6 Idempotency

**Description:**

SA5_FM_IS has a strict set of pre-conditions for those operations, making them not idempotent. E.g. client 1 and client 2 issue ack on alarmId 6. The server processes client 1 request first and state of alarmId 6 is changed to acked. The server will record client 1 as the issuer of the ack. Subsequently, server processes client 2 request and rejects the request, while indicating that alarmId 6 was already acked.

TIP_RAM_IA does not allow idempotency for the ack, unack and clear directives. If executed a second time, a failed id with matching failure code will be returned

At the beginning of the harmonization exercise, TIP RAM was allowing idempotency for these 3 directives. This was changed for better semantic alignment.

In both cases, no change is made alarmId 6 as a result of client 2 request.

**Recommendation:** No further changes required.

**Status:** A

# 8 Minor Differences

## 8.1 Object Model

### 8.1.1 Enumeration Convention

**Description:**

As described in section 1.4.1 of SA5_FM_IS, different conventions are used by each team.

The convention used by 3GPP cannot be directly implemented as no variable can have blanks.

TIP_RAM_IA is using the java constant convention that is suited for coding.

This only a matter of syntax.

**Recommendation:** If 3GPP has other reasons to revise its solution set in a non-backward compatible way, this change should be included.

**Status:** A

### 8.1.2 Tracking records for actions on alarms in Alarm List

**Description:**

SA5_FM_IS is using specific fields in the alarm record where information about actions is stored, i.e. alarm raised time, alarm clear time, alarm acknowledgment time. Only the most recent changes will be recorded, previous changes will not be recorded in the alarm record. Previous changes can be obtained by querying the Notification Log, providing as input the alarmId and the notificationId.

In TIP_RAM_IA the same fields are present. In addition, TIP_RAM_IA is using Tracking Records to provide an history of actions on alarms. A tracking record contains: time of the action, userid, systemid, description of the action, (reference to) alarmId. The access method is getTrackingRecords with input parameter alarmId; the result is a list of tracking records. Tracking records are not part of an alarm.

**Recommendation:** 3GPP SA5 and TIP RAM have similar capabilities. No changes are recommended.

When these capabilities are to be used for auditing, security measures are necessary. On the latter, guidance from operators would be welcome.

**Status:** A

### 8.1.3 Difference in State Diagrams

**Description:**

In SA5_FM_IS, if the perceived severity of an acknowledged alarm is changed, then this alarm becomes unacknowledged. The reason is that an alarm, whose severity has changed, should be brought again to the attention of the operator. This is especially important when the severity is changed from a lower to a higher value.

TIP_RAM does not change the acknowledgment state when the severity is changed. The acknowledgement is considered by most NMS as a trigger for the Localize Resource Trouble level 3 process part of the Resource Trouble Management process. As such, the Agent should not change the acknowledgement state of the alarm, even if the perceived severity of the alarm changes to a higher severity as it would impact the overall RTM process.

**Recommendation:** It was recognized that there is a difference of opinion between 3GPP SA5 and TIP RAM on this subject. No recommendations for alignment could be agreed.

**Status:** D

### 8.1.4 Alarm Reporting Time

**Description:**

SA5_FM_IS uses notification, an emission from Agent to Manager to report alarm information such as alarm raised, alarm cleared. The event time attribute of the notifyNewAlarm notification carries the alarm raised time. SA5 considers the EMS for alarm management be composed of two entities, e.g. the alarm detector/reporter and a notification agent (NA) (e.g. a notification store and forward system). SA5 does not externalize (standardize) the interface between the former and the latter entity. The SA5 defined notification is observable via the interface between the NA and the OSS. This interface is part of the Itf-N for alarm management. Using current SA5 specification, the time when alarm detector/reporter submits alarm notification to NA is not observable. TIP_RAM_IA uses this attribute to indicate the time (as a date + time) at which the alarm was reported. It might be different from the alarmRaisedTime. For instance, if the alarm list is maintained by an EMS, the alarmRaisedtime would be the time the alarm was detected by the NE, while the alarmReportingTime would be the time this alarm was reported by the EMS (submission time to the notification service). alarmReportingTime is supported for compatibility with MTOSI RTM

**Recommendation:** Future requirements may lead SA5 to again study the addition of an attribute, containing the submission time of an alarm from EMS to notification service. Without this addition, both solutions are not harmonized.

**Status:** D

### 8.1.5 State Change Definition

**Description:**

SA5_FM_IS alarm record can carry an attribute called StateChangeDefinition. This purpose of this attribute is specified in ITU-T X.733 as "This parameter, when present, is used to indicate a state transition associated with the alarm." The state change definition is defined in ITU-T Rec. X.731 as "8.2.2.3 State change definition. This parameter set consists of a set of sequences of the three parameters: Attribute identifier, Old attribute value and New attribute value…".

The StateChangeDefinition attribute does not exist in TIP_RAM_IA. The reasons for this choice are the following:

- the TIP RAM team thought the attribute was not really needed, as the NE have quite often states that are slightly different from the values defined in X.731. Adding this attribute therefore is of limited interest.
- this attribute relates to state information and the definition of the state information in SID is different from the definition in ITU-T X.731, so if exposed, this field would have a structure different from the one used in 3GPP Alarm IRP.

So for the reasons above, the choice was made not to expose this attribute in TIP_RAM_IA.

**Recommendation:** It was recognized that there is a difference in the definition of state information between 3GPP SA5 and TIP on this subject. No recommendation for alignment could be agreed.

**Status:** D

### 8.1.6 Monitored Attributes

**Description:**

Both interfaces have this attribute and it is defined in both as a set of attribute value pairs.

SA5_FM_IS alarm record can carry an attribute called monitoredAttributes. It contains three fields: attribute name, attribute value and attribute type. Supported types are string, integer, unsignedInt, boolean, dateTime, base64Binary. The attribute value has the type indicated in the attribute type.

For TIP_RAM_IA, it includes two fields: name and value, both as strings. The datatype used by TIP_RAM_IA is a shared one whose change might impact other models. The TIP RAM team view is that the type of the attribute is known by the attribute name and introducing the type might lead to inconsistencies.

**Recommendation:** The solutions differ only in syntax, not in semantics, hence no changes are needed.

**Status:** A

### 8.1.7 Service User Identification

**Description:**

SA5_FM_IS alarm record can carry a serviceUser attribute. The semantics of it is "It identifies the service-user whose request for service provided by the serviceProvider led to the generation of the security alarm". Note that this attribute is not prefixed with 'security'.

TIP_RAM_IA alarm record can carry an attribute securityServiceUser. Its semantics is "It identifies the service-user whose request for service led to the generation of the security alarm" Note that the attribute name has a prefix to indicate they are specific to security alarms.

**Recommendation:** The solutions differ only in name, not in semantics, hence no changes are needed.

**Status:** A

### 8.1.8 Service Provider Identification

**Description:**

SA5_FM_IS alarm record can carry a serviceProvider attribute. The semantics of it is "It identifies the service-provider whose service is requested by the serviceUser and the service request provokes the generation of the security alarm." Note that this attribute is not prefixed with 'security'.

TIP_RAM_IA alarm record can carry an attribute securityServiceProvider. Its semantics is "It identifies the service-provider whose service request provokes the generation of the security alarm" Note that the attribute name has a prefix to indicate it is specific to security alarms.

**Recommendation:** The solutions differ only in name, not in semantics, hence no changes are needed.

**Status:** A

### 8.1.9 Alarm Detector Identifier

**Description:**

SA5_FM_IS alarm record can carry an attribute `securityAlarmDetector`. It carries the identity of the detector of a security alarm

TIP_RAM_IA alarm record can carry an attribute alarmDetector. Its semantics is "It provides the identity of the detector of an alarm". It has been derived from securityAlarmDetector, but it is not prefixed with 'security' as the alarm detector can detect non security alarms.

**Recommendation:** For security alarms there is no difference in semantics. For non-security alarms, there is a difference. An agreed solution to resolve this difference could not be identified.

**Status:** D

### 8.1.10 Mandatory Comments

**Description:**

An SA5_FM_IS alarm record can carry an attribute called comments. Agent support of this attribute is mandatory if the set comment directive is supported. Note that IRPManager (TMF termed OSS) sets/makes comments on specific alarm in active AlarmList. If IRPManager has set/made a comment on a particular alarm, the alarm record must track/carry the comments; else the alarm record is empty.

In TIP_RAM_IA, comments is an optional field in the Standard and Enhanced profiles.

If the commentResourceAlarms directive is supported by a FM server, then this attribute shall also be supported and comments entered should be visible in the alarm.

**Recommendation:** The solutions are semantically identical, no changes required.

**Status:** A

## 8.2 Notifications

### 8.2.1 notifyComments

**Description:**

SA5_FM_IS emits a notification to all notification subscribers indicating that an IRPManager have set/made comment on a particular active alarm in AlarmList. The notification header has an attribute called notificationType that indicates this type of notifications (as opposed to other types such as one that carry cleared alarm information).

TIP_RAM_IA considers comment as a datatype and therefore uses the changedAlarm notification to carry the "comment" information.

**Recommendation:** The solutions differ only in syntax, not in semantics, hence no changes are needed.

**Status:** A

### 8.2.2 Object Class/Instance in AlarmListRebuilt

**Description:**

SA5_FM_IS has a mandatory capability for IRPAgent to report when its alarmList has been rebuilt. The representation of the entities (e.g. network element) under management is organized/named in hierarchy. Any of these entities can be in alarm state.

Situation one: When Agent loses confidence of the alarm information of the whole hierarchy, it indicates such situation by placing the value of systemDN in the Object Class/ Object Instance fields

Situation two: When Agent loses confidence of the alarm information of part of the hierarchy, it indicates such situation by placing the value of DN of the top managed entity of that hierarchy part in the objectClass/objectInstance field.

TIP_RAM_IA has identical capability. It handles the Situation two (described above) in the same way as in SA5_FM_IS. However, in Situation one, its objectClass/Instance attribute is absent.

TIP_RAM_IA considers its approach cleaner.

**Recommendation:** The solutions are semantically identical. It was noted that both solutions do not support the identification of multiple parts of the hierarchy. Both SA5 and TIP may consider adding this capability. At this moment no changes are proposed.

**Status:** A

## 8.3 Operations

### 8.3.1 Group/Ungroup directives

**Description:**

Because there is no requirement, SA5 does not support a standard interface between its defined Alarm management system and its defined alarm correlation function. SA5 considers the correlation function is an additional, non-mandatory capability or function within the defined Alarm management system. Internal interfaces among functions of Alarm management system are not 'externalized' (or standardized).

See also SA5 comments on 3.3.3, as well as 2.1.

TIP_RAM_IA defines in the Enhanced profile 2 directives groupResourceAlarms and ungroupResourceAlarms to manipulate parent/underlying alarm association. These 2 directives are not present in the Standard profile.

These 2 directives are related to the OSS-to-OSS scenario (see section 2.1) and are only present in the Enhanced profile. As such, they are out of the scope of the harmonization that is based on TIP_RAM_IA Standard profile.

At the beginning of the harmonization exercise, TIP_RAM was not including the Enhanced profile and those directives were part of the comparison scope. This was changed for better semantic alignment.

**Recommendation:** It was concluded that the solutions are semantically aligned, no changes required.

**Status:** A

### 8.3.2 Input alarm id

**Description:**

SA5_FM_IS uses a set of alarm ids as input for unack, clear and comment directives.

TIP_RAM_IA uses a set of identifiers, which are the equivalent form, but using the TIP identifier.

**Recommendation:** Semantics are identical, hence no changes are needed.

**Status:** A

### 8.3.3 Input alarm id + severity for acknowledge directive

**Description:**

SA5_FM_IS uses for the ack directive a set of (alarm id + severity) while for the other directives, like unack, clear and comment, it uses only a set of alarm id. The following interaction illustrates the undesirable consequences if acknowledgement is done without providing the perceived severity:

1. IRPAgent AlarmList has alarm=6 with perceivedSeverity=minor
2. IRPManager issues getAlarmList
3. IRPAgent updates alarm=6 with perceivedSeverity=critical
4. IRPManager issues acknowledgement of alarm=6 w/o use of perceivedSeverity
5. IRPAgent responds successfully, i.e. alarm=6 is acknowledged

The undesirable consequences are:

- IRPManager wrongly thinks he had acknowledged alarm=6 with perceivedSeverity=minor
- IRPAgent acknowledged alarm=6 with perceivedSeverity=critical
- Other IRPManagers will see alarm=6 with perceivedSeverity=critical being acknowledged by the "acknowledging" IRPManager

SA5 plans adding this scenario into its specifications.

TIP_RAM_IA uses for the ack directive only a set of alarm id. The acknowledgement is considered by most NMS as a trigger for the Localize Resource Trouble level 3 process part of the Resource Trouble Management process. As such, the Agent should not change the acknowledgement state of the alarm, even if the perceived severity of the alarm changes to a higher severity as it would impact the overall RTM process.

**Recommendation:** See also section 4.1.3. It was recognized that there is a difference of opinion between 3GPP SA5 and TIP RAM on this subject. No recommendations for alignment could be agreed.

**Status:** D

### 8.3.4 Tracking Info as input

**Description:**

SA5_FM_IS Alarm IRP has the following:

- unacknowledgementAlarms: ackUserId, ackSystemId,
- clearAlarms: clearUserId, clearSystemId,
- acknowledgeAlarms: ackUserId, ackSystemId.

TIP_RAM_IA uses user id and system id parameters for the ack, unack and clear directives.

At the beginning of the harmonization exercise, a Tracking Record parameter (grouping user id and system id) was used in this directive. The use of two parameters is for better semantic alignment.

**Recommendation:** no further changes needed.

**Status:** A

### 8.3.5 Specific format for bad alarm info for acknowledge directive

**Description:**

SA5_FM_IS uses as output for the unack, clear and comment directives a set of alarm id and failure reason as string. However for the ack directive, there are 2 failure reasons: one as an enum and an additional one as string.

TIP_RAM_IA uses also for output of the ack, unack, clear and comment directives a set of alarm id, corresponding the failing ids and failure reason as string.

At the beginning of the harmonization exercise, TIP RAM was returning the ids of the objects successfully modified and no failure reason. This was changed for better semantic alignment.

**Recommendation:** The difference is at the syntax level; semantically SA5_FM_IS and TIP_RAM_IA are aligned, so no changes are needed.

**Status:** A

### 8.3.6 Output status parameter

**Description:**

SA5_FM_IS has a parameter in all responses/confirmations indicating whether the operation was successful or not.

[SA5] Any 3GPP Interface IRP specification, as well as any 3GPP NRM IRP specification, adheres to the modeling concept of separation of semantics (meaning) and syntax of model elements. The former is documented in Information Service specifications. The latter is documented in Solution Set specifications. The mapping from IS-level defined modeled elements to SS-level defined modeled elements are also specified in SS-level specification. All IRP IS-level operation definition include an output parameter called Status that is an ENUM of SUCCESS, FAILURE and PARTIALSUCCESS.

SA5_FM_IS does not have such parameter. It handles all not successful operations by means of exceptions.

Refer also to section 4.3.9.

**Recommendation:** The difference is at the syntax level; semantically SA5_FM_IS and TIP_RAM_IA are aligned, so no changes are needed

**Status:** A

### 8.3.7 Input comment information

**Description:**

SA5_FM_IS, in the SetComment operation, uses separate parameters for text, user id and system id.

TIP_RAM_IA uses also separate parameters for text, user id and system id.

At the beginning of the harmonization exercise, a Comment datatype was used in this directive to pass text, user id and system id and this was changed for better semantic alignment.

**Recommendation:** no further changes are needed.

**Status:** A

### 8.3.8 Filter type

**Description:**

SA5_FM_IS uses a filter in directives; this filter seems to be based on xpath for.

The 3GPP Alarm IRP CORBA SS filter is specified using OMG defined EXTENDED_TCL. The 3GPP Alarm IRP XML SS filter is specified using W3C defined XPath.

In TIP_RAM_IA, the filter for common directives (get and set) is a choice of template or query filter. Template filter is based on combination of attribute values of the objects. Query filter is based on xpath.

For the count directives, TIP_RAM_IA only uses a query (xpath) filter.

The use of template in RAM common directives is bringing some more ease of use, so TIP_RAM think it should be kept. For the query part, the use of xpath is common.

**Recommendation:** There is some difference at the syntax level; semantically SA5_FM_IS and TIP_RAM_IA are aligned, so no changes are needed.

**Status:** A

### 8.3.9 Exceptions

**Description:**

[SA5] The SA5_FM operation definition uses STATUS that is an ENUM of OperationSucceeded, OperationFailed and OperationPartiallySucceeded. For the cases of OperationFailed and OperationPartiallySucceeded, additionally the failure reason is provided.

All TIP operations includes 6 pre-defined exceptions applicable to all directives. The pre-defined exceptions defined in TIP are:

- AccessDenied
- CommunicationLoss
- InternalError
- InvalidInput
- NotImplemented
- UnableToComply

Some TIP_RAM operations are also using the exceptions NotInValidState and EntityNotFound. All exceptions include a reason field providing the reason the exception was raised.

**Recommendation:** The difference is at the syntax level; semantically SA5_FM_IS and TIP_RAM_IA are aligned, so no changes are needed.

**Status:** A

# 9 Interface Harmonization

## 9.1 Interface in FMC NM environment

This section suggests a configuration regarding interface (or NM protocols) for use in FMC NM environment.

Operators have expressed the wish to "eliminate silos" in FMC NM environment, believing silo elimination can reduce OPEX. Using the diagram below, the operators' goal is that protocol-X and protocol-Y are identical, e.g., the same alarm handling protocol for fault management.

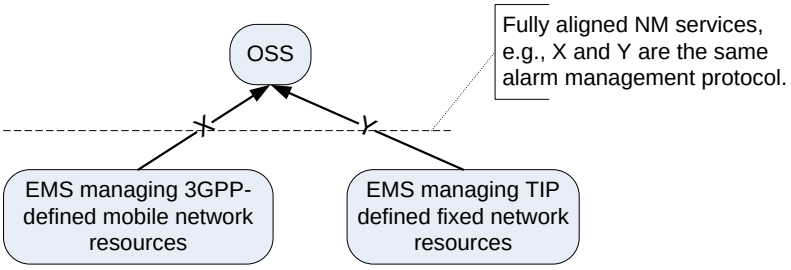


**Figure 1: Elimination of Silos**

The work done as part of the FM Harmonization has shown that the "elimination of silos" is not a feasible scenario in the near term and has focused on a semantic alignment to bring the 2 interfaces closer.

## 9.2 Current situation

Operators/TM Forum/3GPP current focus is on the harmonization of relevant specifications of TM Forum and 3GPP/SA5.

From a cross-SDO perspective, the FMC NM environment would, at the minimum, include the backhaul networks for mobile access network. The following client-server model illustrates the situation. This FMC NM environment supports OSS to manage:

- the 3GPP-defined network resources using Protocol-2 (3GPP OA&M [6])
- the IP/MPLS network resources using Protocol-5 (TMF SD1-44 [17]) or 3 (MEF 7.1 [11]
- the ATM network resources using protocol-7 (ATM MIB [8])
- the 3GPP2-defined network resources using protocol-4 (3GPP2 NRM [7])
- the wireline network resources using protocol 5 (TMF MTOSI [12]

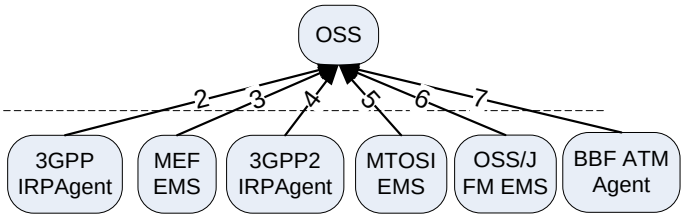


**Figure 2: NM services for management of mobile networks and its backhauls**

This figure illustrates the FMC NM standards would involve SDOs and organizations besides 3GPP and TM Forum(as indicated in figure 1.)

It is noted that, the protocols-2, 3, 4, 5 and 7 (for alarm handling, for example) existed as standards for years. These standards were developed independently by the individual SDOs, and thus there is only limited alignment between them.

## 9.3 Proposed alternative

The situation today is some way from the stated goal of a single interface as the interfaces from all SDOs differ and no common interface has yet been agreed. Even if there were a common interface it would not be realistic to expect all systems currently implemented and deployed to be converted to that common interface.

This section proposes a practical way forward.

1. Each Agent or EMS continues to provide the network and device view of their respective domain. Expressed in another way, OSS uses the:
   - 3GPP IRP framework (see [6]) to manage the 3GPP-defined mobile network and devices,
   - BBF-defined framework (see [8]) to manage the BBF-defined ATM network and devices
   - TM Forum-defined framework (see [13]) to manage fixed networks and resources
   - etc.
2. The frameworks mentioned in the bullets are, over time, aligned as closely as possible and are converged in any overlapping areas:
   - Possible methods to accomplish this include semantic alignment agreement between SDOs or by the use of the Umbrella classes [1] currently being defined by the 3GPP/TMF JWG on Model Alignment. This allows Agents and EMSs to support domain specific network views that are consistent with each other.
   - Such consistency is necessary for OSS to combine various domain network management views to an "end-to-end" network view for use by its clients/users (e.g. high layer functions).
   - Each SDO is at liberty to enhance their local solution as necessary to support ongoing commitments but should bias enhancements towards an appropriate converged solution.

We note that the NM services provided by individual Agent or EMS, regardless if they are using the same alarm network management protocol or not a) cannot support the so-called "end-to-end" view of the FMC network and b) cannot support the so-called "seamless integration with higher layer business objects or processes". The "end-to-end" view can only be provided by OSS. The service providing "seamless integration …" can only be provided by OSS with use of multi-technology, multi-domain API set, if deemed necessary.

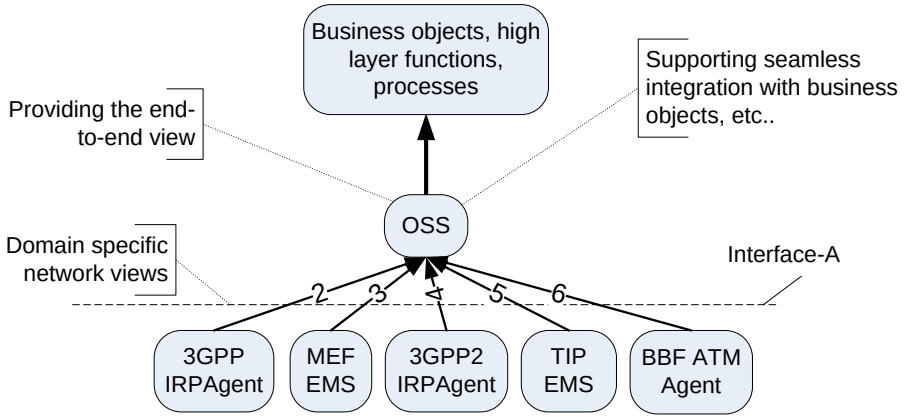


**Figure 3: Proposal for harmonized NM services in FMC NM environment**

# Annex A:
# Change history

| Change history | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Date** | **TSG #** | **TSG Doc.** | **CR** | **Rev** | **Subject/Comment** | **Old** | **New** |
| 2012-08 | | | | | Initial Draft based on [22] V1.1 | --- | 0.1.0 |
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